



Contribution ID: 158

Type: not specified

# The Case of Light Neutralino Dark Matter

*Monday, 5 May 2014 16:45 (15 minutes)*

We study the light ( $<40$  GeV) neutralino Dark Matter (DM) in the framework of Next-to-Minimal-Supersymmetric-Standard-Model (NMSSM). We focus on three types of light DM solutions that satisfying current collider constraints from the LEP, Tevatron, LHC, direct detections and relic density requirements.

Type-i may take place in any theory with a light (pseudo-)scalar, while Type-ii and iii can occur in the framework of Minimal-Supersymmetric-Standard-Model (MSSM) as well. These possible solutions all have very distinctive features from the perspective of DM astrophysics and collider phenomenology. We present a comprehensive study on these solutions and focus on the observational implications of these solutions at colliders, including new phenomena in Higgs physics, missing energy searches and light stermion searches. The signal becomes hard to observe at the LHC when the LSP mass is nearly degenerate with the parent, dubbed as the "compressed spectrum". We discuss possible probes at the ILC for such scenarios.

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**Session Classification:** Dark Matter II